

REMARKS

RESTRICTION REQUIREMENT

Applicants affirm the election of the claims of group I, Claims 1-34, drawn to a method, and the withdrawal group II, claims 35-41, without traverse.

CLAIM OBJECTIONS

Claim 14 is objected to because of the following formalities:
“methoxyprpyltrimethoxysilane” apparently should be—methoxypropyltrimethoxysilane – (“prpyl” is missing the letter “o”). Claim 14 has been amended accordingly to overcome this objection.

DOUBLE PATENTING

Claims 1-5, 10-13, 15, 18, 26, and 28 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 46 of copending Application No. 10/268,132, RamachandraRao et al. (Applicants’ Amendment, filed Dec. 22, 2004), in view of Hacker et al. (U.S. Patent Appl. Pub. No. 2004/0013958). This is a provisional obviousness-type double patenting rejection.

Claims 6, 16-17, and 19 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 46 of copending Application No. 10/268,132, RamachandraRao et al. in view of Hacker, in further view of Komatsu et al. (U.S. Patent No. 6,451,436).

Claims 25, 27, and 32 are provisionally rejected under the judicially created doctrine of double patenting over claims 46 and 50 copending Application No. 10/268,132, RamachandraRao et al. (Applicants' Amendment, filed Dec. 22, 2004).

The Applicant respectfully submits that the claims as currently amended overcome the provisional double patenting rejection because the claims as currently amended no longer read upon the teachings of RamachandraRao et al. (Applicants' Amendment, filed Dec. 22, 2004) alone or in combination with Hacker or Komatsu.

Claim Rejections - 35 U.S.C. §102 and § 103

The Examiner has rejected claims 1-5, 7-8, 10-13, 15, 18-19, 25-28, and 32 under 35 U.S.C. 102(e) as unpatentable over RamachandraRao (U.S. Patent Publication No. 2004/0072436). The Applicant respectfully traverses. RamachandraRao fails to teach all of the elements of the Applicants' claimed invention.

In particular, RamachandraRao fails to teach the element of independent claim 1 of *"exposing the dielectric to a silane coupling reagent comprising an oligomer of an alkoxysilane, to form a continuous layer over the surface of the interlayer dielectric,"* the element of independent claim 11 of *"exposing the dielectric to an oxidant to prepare the surface of the dielectric and treating the surface of the dielectric with a silane coupling reagent after exposing the dielectric to the oxidant to seal the pores exposed on the surface of the dielectric,"* or the element of independent claim 25 of independent claim 25 of *"exposing the surface of the dielectric to a silane coupling reagent, wherein the silane coupling reagent comprises an oligomeric structure designed to fill the pore with one molecule."* In contrast RamachandraRao teaches exposing ILD surfaces damaged by plasma to a silane coupling agent to repair the damaged ILD surface (pg. 2 paragraph 24, RamachandraRao.) RamachandraRao exposes an ILD to a plasma during ashing and priming steps to expose photoresist and antireflective coating material to prepare each for solvent and/or wet etch removal. During each step the dielectric material is exposed to damaging techniques and a silane coupling reagent is then exposed to the ILD to repair that damage (pg. 4 paragraph 37, RamachandraRao). Therefore, the Applicants' respectfully submit that the independent claims 1, 11, and 25 and the claims that depend upon and incorporate the limitations of the independent claims are not anticipated by RamachandraRao.

The Examiner has rejected claims 1-2, 4-5, and 9 under 35 U.S.C. 103(a) as unpatentable over Catabay et al. (U.S. Patent No. 6,537,896) in view of Hacker et al. (U.S. Patent Publication No. 2004/0013858). The Examiner has rejected claims 3, 6, and 10 under

35 U.S.C. 103(a) as unpatentable over Catabay et al. (U.S. Patent No. 6,537,896) in view of Hacker et al. (U.S. Patent Publication No. 2004/0013858) and further in view of Komatsu (U.S. Patent No. 6,451,436 B1). The Examiner has rejected claims 11-12 and 25-26 under 35 U.S.C. 102(e) as unpatentable over Catabay et al. (U.S. Patent No. 6,537,896). The Examiner has rejected claims 13, 15-19 and 27-32 under 35 U.S.C. 103(a) as unpatentable over Catabay et al. (U.S. Patent No. 6,537,896) in view of Komatsu (U.S. Patent No. 6,451,436 B1). The Examiner has rejected claims 21-24 under 35 U.S.C. 103(a) as unpatentable over Catabay et al. (U.S. Patent No. 6,537,896) in view of Yau et al. (U.S. Patent No. 6,054,379). The Examiner has rejected claims 14 and 33-34 under 35 U.S.C. 103(a) as unpatentable over Catabay et al. (U.S. Patent No. 6,537,896) in view of Komatsu (U.S. Patent No. 6,451,436 B1) and further in view of Kloster et al. (U.S. Patent Publication No. 2004/0214427).

The Applicant respectfully traverses. The cited references, either individually or in combination, fail to teach all of the elements of the Applicants' claimed invention. In particular, the cited references fail to teach the element of independent claim 1 of "*exposing the dielectric to a silane coupling reagent comprising an oligomer of an alkoxysilane, to form a continuous layer over the surface of the interlayer dielectric,*" the element of independent claim 11 of "*exposing the dielectric to an oxidant to prepare the surface of the dielectric and treating the surface of the dielectric with a silane coupling reagent after exposing the dielectric to the oxidant to seal the pores exposed on the surface of the dielectric,*" or the element of independent claim 25 of independent claim 25 of "*exposing the surface of the dielectric to a silane coupling reagent, wherein the silane coupling reagent comprises an oligomeric structure designed to fill the pore with one molecule.*" In contrast, Catabay teaches a process for forming a non-porous dielectric diffusion barrier layer on etched via and trench sidewall surfaces in a layer of porous low k dielectric material comprises exposing such etched surfaces to a plasma formed from one or more gases such as, for example, O₂ and SiH₄ or even methylsilane and hydrogen peroxide (col. 4 lines 41 – 45, col. 7 line 42.) Catabay does not teach oxidizing the ILD surface before exposing the ILD to a silane, but rather teaches exposing the ILD to an oxidant at the same time that the ILD is exposed to a silane. Hacker contacts a damaged silica dielectric film with a surface

modification composition, the examples of which in paragraph 33 on pg. 2 of Hacker do not include oligomers of alkoxysilanes. Komatsu teaches a coating liquid for forming a silica-containing film with a low-dielectric constant formed of a polymer composition of a hydrolyzate of an alkoxysilane and at least one halogenated silane (abstract). Komatsu therefore teaches a polymer and not an oligomer. Yau teaches a method of depositing a low dielectric constant film with an organosilane compound and an oxidizing gas (abstract.) Therefore, Yau fails to teach exposing a dielectric to an oligomer to form a continuous film on a dielectric, but instead teaches forming the dielectric itself. Yau also fails to teach oxidizing the surface of the dielectric before forming the film on the dielectric. Kloster teaches a pore filling material to seal pores in oxide dielectric materials followed by condensation of the pore filling material (pg. 3 paragraph 33), but fails to teach the elements of the independent claims. Therefore, the Applicants' respectfully submit that the cited references fail to teach or render obvious the independent claims 1, 11 and 25 and the claims that depend upon and incorporate the limitations of the independent claims.